
Statistical Methods in Actuarial Science

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Quantiles Estimation from Heavy-Tailed Distribution

In this work, we estimate quantiles (and other risk measures) from a nonparametric density estimation based on transformed data. A parametric cumulative distribution function is initially used to transform the data into values over the unit interval, from which a nonparametric density estimation is obtained. Finally, an estimation of the density of the original sample is obtained by back-transformation. This approach may be particularly useful to estimate heavy-tailed distributions. We discuss its implementation and its finite sample properties for density estimation, and for estimation and inference with quantiles.

EDWARD FURMAN, York University

Background Risk Models: Theory and Applications

Let the coordinates of the non-negative $m(\in \mathbf{N})$ -variate r.v. $\mathbf{Y} = (Y_1, \dots, Y_m)'$ be interpreted as possibly dependent risk factors (r.f.'s), and denote by $\mathbf{X} = (X_1, \dots, X_n)'$ risk portfolio (r.p.), whose risk components X_i are exposed to (sub)sets $\mathcal{S}_i \subseteq \{1, \dots, m\}$, $i = 1, \dots, n$ of the r.f.'s Y_j , $j = 1, \dots, m$. Let \mathcal{Y} and \mathcal{X} be collections of the r.f.'s and the r.p.'s, respectively. I will discuss maps $T : \mathcal{Y} \rightarrow \mathcal{X}$ and hence r.p.'s $X = T(Y)$ that yield additive and multiplicative background risk models. More specifically, I will examine connections between the two, derive the underlying dependencies formally and explore the implications, state characteristic results and touch on some well-known special cases, formulate admissible classes of distributions of the r.f.'s. I will conclude with a number of applications to actuarial pricing and risk measurement.

NATALIA NOLDE, University of British Columbia

The Effect of Aggregation on Extremes from Asymptotically Independent Light-Tailed Risks

Portfolio risk diversification is a well-established concept in finance and insurance. While aggregation of several risky assets generally reduces the overall investment risk, the effectiveness of diversification depends on the stochastic properties of the assets comprising the portfolio. A new approach to quantifying the effect of portfolio tail diversification is proposed under the assumption of existence of a limit set. This property is satisfied by a number of distributions commonly used in financial applications. Several analytical examples are given to illustrate the proposed asymptotic diversification index as a measure of the effect of risk aggregation on extremes as well as to quantify the impact of dimension on diversification and as a tool in optimal portfolio selection.